# VACON® 10
AC DRIVES

# QUICK GUIDE

VACON®
DRIVEN BY DRIVES

**NOTE! You can download the English and French product manuals with applicable safety, warning and caution information from [www.vacon.com/downloads](www.vacon.com/downloads).**

**REMARQUE Vous pouvez télécharger les versions anglaise et française des manuels produit contenant l'ensemble des informations de sécurité, avertissements et mises en garde applicables sur le site [www.vacon.com/downloads](www.vacon.com/downloads).**

**This quick guide includes the essential steps for easy installation and setup of your Vacon 10 frequency converter. Before commissioning your drive, download and read the complete Vacon 10 User Manual available at:**

**www.vacon.com -> Downloads**

## 1. SAFETY

**ONLY A COMPETENT ELECTRICIAN IS ALLOWED TO CARRY OUT THE ELECTRICAL INSTALLATION!**

This quick guide contains clearly marked warnings which are intended for your personal safety and to avoid any unintentional damage to the product or connected appliances.

**Please read these warnings carefully:**

The components of the power unit of the frequency converter are live when Vacon 10 is connected to mains. Coming into contact with this voltage is extremely dangerous and may cause death or severe injury.

The motor terminals U, V, W (T1, T2, T3) and the possible brake resistor terminals - / + are live when Vacon 10 is connected to mains, even if the motor is not running.

The control I / O-terminals are isolated from the mains potential. However, the relay output terminals may have a dangerous control voltage present even when Vacon 10 is disconnected from mains.

The earth leakage current of Vacon 10 frequency converters exceeds 3.5 mA AC. According to standard EN61800-5-1, a reinforced protective ground connection must be ensured. **See Chapter 7!**

If the frequency converter is used as a part of a machine, the machine manufacturer is responsible for providing the machine with a main switch (EN 60204-1).

If Vacon 10 is disconnected from mains while running the motor, it remains live if the motor is energized by the process. In this case the motor functions as a generator feeding energy to the frequency converter.

After disconnecting the frequency converter from the mains, wait until the fan stops and the display segments or status leds on the front panel go out. Wait 5 more minutes before doing any work on Vacon 10 connections.

The motor can start automatically after a fault situation, if the autoreset function has been activated.

# 2. INSTALLATION

## 2.1 Mechanical installation

There are two possible ways to mount Vacon 10 in the wall. either screw or DIN-rail mounting.

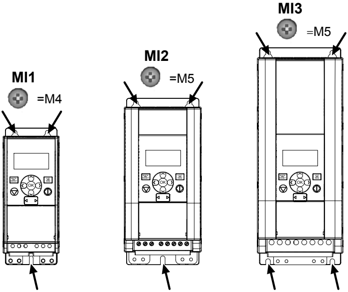



*Figure 2.1: Screw mounting, MI1 - MI3*

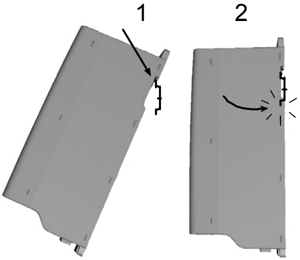



*Figure 2.2: DIN-rail mounting, MI1 - MI3*

**Note!** See the mounting dimensions on the back of the drive.
Leave **free space** for cooling above (**100 mm**), below (**50 mm**), and on the sides (**20 mm**) of Vacon 10! [ side-to-side installation allowed only if the ambient temperature is below 40 °C.]

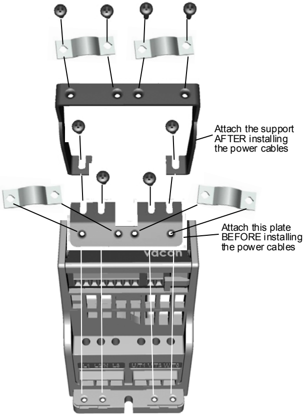



*Figure 2.3: Attaching the PE-plate and API cable support, MI1 - MI3*

## 2.2 Cabling and connections

### *2.2.1 Power cabling*

**Note!** Tightening torque for power cables is 0.5 - 0.6 Nm (4-5 in.lbs).

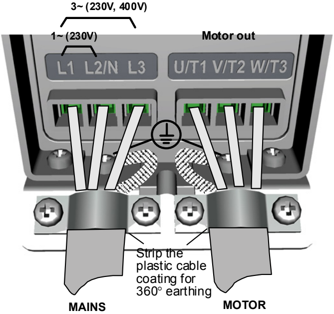



*Figure 2.4: Vacon 10 power connections, MI1*

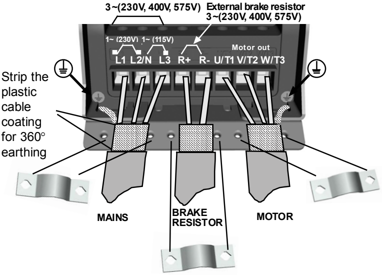



*Figure 2.5: Vacon 10 power connections, MI2 - MI3*

### 2.2.2 Control cabling

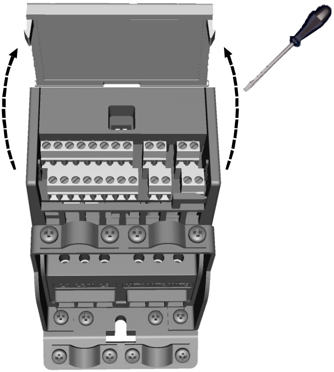


*Figure 2.6: Open the lid MI1 - MI3*

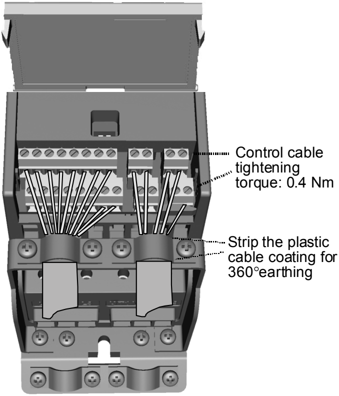
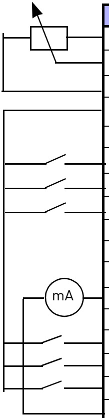



*Figure 2.7: Install the control cables, MI1 - MI3*

## 3. CONTROL I / O AND TERMINALS




| Terminal | | Signal | Factory preset | Description |
|---|---|---|---|---|
| 1 | +10Vref | Ref. voltage out | | Maximum load 10 mA |
| 2 | AI1 | Analog signal in 1 | Freq. reference P) | 0 - 10 V Ri = 200 kΩ |
| 3 | GND | I/O signal ground | | |
| 6 | 24Vout | 24V output for DI's | | ±20 %, max. load 50 mA |
| 7 | GND | I/O signal ground | | |
| 8 | DI1 | Digital input 1 | Start forward P) | 0 - +30 V Ri = 12 kΩmin |
| 9 | DI2 | Digital input 2 | Start reverse P) | |
| 10 | DI3 | Digital input 3 | Fault reset P) | |
| A | A | RS485 signal A | FB Communication | Negative |
| B | B | RS485 signal B | FB Communication | Positive |
| 4 | AI2 | Analog signal in 2 | PI actual value P) | 0(4) - 20 mA, Ri = 200Ω |
| 5 | GND | I/O signal ground | | |
| 13 | GND | I/O signal ground | | |
| 14 | DI4 | Digital input 4 | Preset speed B0 P) | 0 - +30 V Ri = 12 kΩ (min) |
| 15 | DI5 | Digital input 5 | Preset speed B1 P) | |
| 16 | DI6 | Digital input 6 | External fault P) | |
| 18 | AO | Analog Output | Output frequency P) | 0(4) - 20 mA, RL = 500Ω |
| 20 | DO | Digital signal out | Active = READY P) | Open collector, max. load 48V/50mA |
| 22 | RO 13 | Relay out 1 | Active = RUN P) | Max. switching load: 250Vac/2A or 250Vdc/ 0,4A |
| 23 | RO 14 | | | |
| 24 | RO 22 | Relay out 2 | Active = FAULT P) | Max. switching load: 250Vac/2A or 250Vdc/ 0,4A |
| 25 | RO 21 | | | |
| 26 | RO 24 | | | |

*Table 3.1: Vacon 10 default I/O configuration and connections*
*P) = Programmable function, see parameter lists and descriptions, chapters 5.*

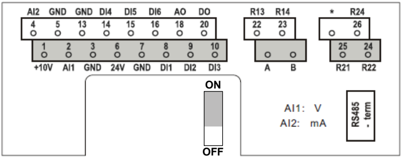



*Figure 3.1: Vacon 10 I / O*

# 4. NAVIGATION & STARTUP

## 4. 1 The main menus of Vacon 10

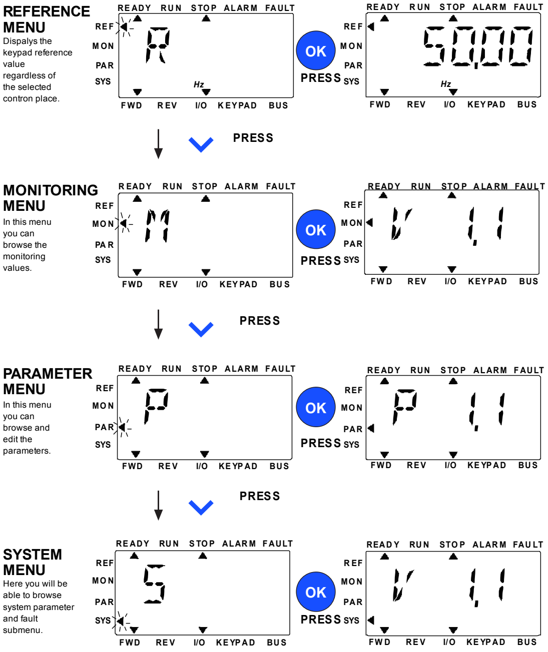



*Figure 4.1: The main menu of Vacon 10*

## 4.2 Commissioning and startup wizard

### *4.2.1 Commissioning steps:*

| | |
|---|---|
| 1. Read safety instructions on page 1 | 7. Perform test run **without motor**, see the User Manual at www.vacon.com |
| 2. Secure the grounding and check that cables comply with requirements | 8. Run no-load tests without motor being connected to the process |
| 3. Check quality and quantity of cooling air | 9. Perform an identification run (Par. ID631) |
| 4. Check that all start / stop switches are in **STOP** position | 10. Connect the motor to the process and perform test run once again |
| 5. Connect the drive to mains | 11. Vacon 10 is now ready for use |
| 6. Run the Startup wizard and set all necessary parameters | |

*Table 4.1: Commissioning steps*

### *4.2.2 Startup wizard*

Vacon 10 runs the startup wizard in first power-up. The wizard can be run by setting SYS Par.4.2 =1. The following figures show the procedure.

**NOTE! Running the startup wizard will always return all parameter settings to their factory defaults!**

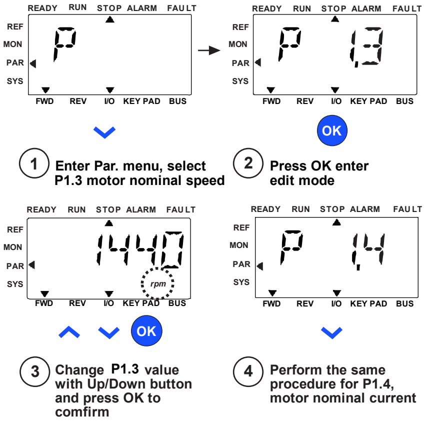
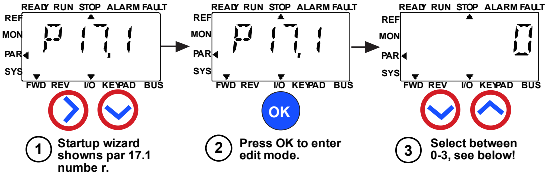



*Figure 4.2: Vacon 10 startup wizard (standard application)*




**Selections:**

| | P1.7 | P1.8 | P1.15 | P2.2 | P2.3 | P3.1 | P4.2 | P4.3 |
|---|---|---|---|---|---|---|---|---|
| 0 = Basic | 1,5 x $I_{NMOT}$ | 0= Frequecny control | 0= Not used | 0= Ramp | 0= Coast | 0 Hz | 3s | 3s |
| 1 = Pump drive | 1,1 x $I_{NMOT}$ | 0= Frequecny control | 0= Not used | 0= Ramp | 1= Ramp | 20 Hz | 5s | 5s |
| 2 = Fan drive | 1,1 x $I_{NMOT}$ | 0= Frequecny control | 0= Not used | 1= Flying | 0= Coast | 20 Hz | 20s | 20s |
| 3 = High Torque drive | 1,5 x $I_{NMOT}$ | 1=Open loop speed ontrol | 1= used | 0= Ramp | 0= Coast | 0 Hz | 1s | 1s |

**Parameters affected:**

P1.7 Current limit (A)
P1.8 Motor control mode
P1.15 Torque boost
P2.2 Start function
P2.3 Stop function
P3.1 Min frequency
P4.2 Acc. time (s)
P4.3 Dec time (s)

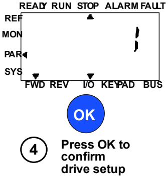



*Figure 4.3: Drive setup*

# 5. MONITORING & PARAMETERS

**NOTE! This guide is for Vacon 10 standard application, if you need description of parameters in detail, please download the application manual on: www.vacon.com -> downloads.**

## 5.1 Monitoring values

| Code | Monitoring signal | Unit | ID | Description |
|---|---|---|---|---|
| V1.1 | Output frequency | Hz | 1 | Output frequency to motor |
| V1.2 | Frequency reference | Hz | 25 | Frequency reference to motor control |
| V1.3 | Motor speed | rpm | 2 | Calculated motor speed |
| V1.4 | Motor current | A | 3 | Measured motor current |
| V1.5 | Motor torque | % | 4 | Calculated actual / nominal torque of the motor |
| V1.6 | Motor Power | % | 5 | Calculated actual / nominal power of the motor |
| V1.7 | Motor voltage | V | 6 | Motor voltage |
| V1.8 | DC-link voltage | V | 7 | Measured DC-link voltage |
| V1.9 | Drive temperature | °C | 8 | Heatsink temperature |
| V1.10 | Motor temperature | % | 9 | Calculated motor temperature |
| V2.1 | Analog input 1 | % | 59 | AI1 signal range in percent of used range |
| V2.2 | Analog input 2 | % | 60 | AI2 signal range in percent of used range |
| V2.3 | Analog output | % | 81 | AO signal range in percent of used range |
| V2.4 | Digital input status DI1, DI2, DI3 | | 15 | Digital input status |
| V2.5 | Digital input status DI4, DI5, DI6 | | 16 | Digital input status |
| V2.6 | RO1, RO2, DO | | 17 | Relay / digital output status |
| V4.1 | PI setpoint | % | 20 | Regulator setpoint |
| V4.2 | PI feedback value | % | 21 | Regulator actual value |
| V4.3 | PI error | % | 22 | Regulator error |
| V4.4 | PI output | % | 23 | Regulator output |

*Table 5.1: Vacon 10 monitoring signals*

## 5.2 Quick setup parameters (Virtual menu, shows when par. 17.2 = 1)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P1.1 | Motor nominal voltage | 180 | 690 | V | Varies | 110 | Check rating plate on the motor |
| P1.2 | Motor nominal frequency | 30,00 | 320,00 | Hz | 50,00 / 60,00 | 111 | Check rating plate on the motor |
| P1.3 | Motor nominal speed | 30 | 20000 | rpm | 1440 / 1720 | 112 | Default applies for a 4-pole motor |
| P1.4 | Motor nominal current | 0,2 x $I_{Nunit}$ | 2,0 x $I_{Nunit}$ | A | $I_{Nunit}$ | 113 | Check rating plate on the motor |
| P1.5 | Motor cos $\varphi$ (Power Factor) | 0,30 | 1,00 | | 0,85 | 120 | Check rating plate on the motor |
| P1.7 | Current limit | 0,2 x $I_{Nunit}$ | 2,0 x $I_{Nunit}$ | A | 1,5 x $I_{Nunit}$ | 107 | Maximum motor current |
| P1.15 | Torque boost | 0 | 1 | | 0 | 109 | **0** = Not used<br>**1** = Used |
| P2.1 | Remote control place 1 selection | 0 | 1 | | 0 | 172 | **0** = I / O terminal<br>**1** = Fieldbus |
| P2.2 | Start function | 0 | 1 | | 0 | 505 | **0** = Ramp<br>**1** = Flying start |
| P2.3 | Stop function | 0 | 1 | | 0 | 506 | **0** = Coasting<br>**1** = Ramp |
| P3.1 | Min frequency | 0,00 | P3.2 | Hz | 0,00 | 101 | Minimum freq reference |
| P3.2 | Max frequency | P3.1 | 320,00 | Hz | 50,00 / 60,00 | 102 | Maximum freq reference |
| P3.3 | Remote Control Place 1 frequency reference selection | 1 | 6 | | 4 | 117 | **1** = Preset Speed 0<br>**2** = Keypad<br>**3** = Fieldbus<br>**4** = AI1<br>**5** = AI2<br>**6** = PI |
| P3.4 | Preset speed 0 | P3.1 | P3.2 | Hz | 5,00 | 180 | Activated by digital inputs |
| P3.5 | Preset speed 1 | P3.1 | P3.2 | Hz | 10,00 | 105 | Activated by digital inputs |
| P3.6 | Preset speed 2 | P3.1 | P3.2 | Hz | 15,00 | 106 | Activated by digital inputs |
| P3.7 | Preset speed 3 | P3.1 | P3.2 | Hz | 20,00 | 126 | Activated by digital inputs |

*Table 5.2: Quick setup parameters*

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P4.2 | Acceleration time 1 | 0,1 | 3000,0 | s | 3,0 | 103 | Acceleration time from 0 Hz to maximum frequency. |
| P4.3 | Deceleration time 1 | 0,1 | 3000,0 | s | 3,0 | 104 | Deceleration time from maximum frequency to 0 Hz. |
| P6.1 | AI1 Signal range | 0 | 1 |  | 0 | 379 | **0** = 0 - 100%<br>**1** = 20% - 100%<br>20% is the same as 2 V minimum signal level. |
| P6.5 | AI2 Signal range | 0 | 1 |  | 0 | 390 | **0** = 0 - 100%<br>**1** = 20% - 100%<br>20% is the same as 4 mA minimum signal level. |
| P14.1 | Automatic reset | 0 | 1 |  | 0 | 731 | **0** = Disable<br>**1** = Enable |
| P17.2 | Parameter conceal | 0 | 1 |  | 1 | 115 | **0** = All parameters visible<br>**1** = Only quick setup parameter group visible |

*Table 5.2: Quick setup parameters*

## 5.3 Motor settings (Control panel: Menu PAR -> P1)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P1.1 | Motor nominal voltage | 180 | 690 | V | Varies | 110 | Check rating plate on the motor |
| P1.2 | Motor nominal frequency | 30,00 | 320,00 | Hz | 50,00 / 60,00 | 111 | Check rating plate on the motor |
| P1.3 | Motor nominal speed | 30 | 20000 | rpm | 1440 / 1720 | 112 | Default applies for a 4-pole motor |
| P1.4 | Motor nominal current | 0,2 x $I_{Nunit}$ | 2,0 x $I_{Nunit}$ | A | $I_{Nunit}$ | 113 | Check rating plate on the motor |
| P1.5 | Motor cos $\varphi$ (Power Factor) | 0,30 | 1,00 | | 0,85 | 120 | Check rating plate on the motor |
| P1.7 | Current limit | 0,2 x $I_{Nunit}$ | 2,0 x $I_{Nunit}$ | A | 1,5 x $I_{Nunit}$ | 107 | Maximum motor current |
| P1.8 | Motor control mode | 0 | 1 | | 0 | 600 | **0** = Frequency control<br>**1** = Open loop speed control |
| P1.9 | U / f ratio | 0 | 2 | | 0 | 108 | **0** = Linear<br>**1** = Square<br>**2** = Programmable |
| P1.10 | Field weakening point | 8,00 | 320,00 | Hz | 50,00 / 60,00 | 602 | Field weakening point frequency |
| P1.11 | Field weakening point voltage | 10,00 | 200,00 | % | 100,00 | 603 | Voltage at field weakening point as % of $U_{nmot}$ |
| P1.12 | U / f mid point frequency | 0,00 | P1.10 | Hz | 50,00 / 60,00 | 604 | Mid point frequency for programmable U / f |
| P1.13 | U / f mid point voltage | 0,00 | P1.11 | % | 100,00 | 605 | Mid point voltage for programmable U / f as % of $U_{nmot}$ |
| P1.14 | Zero freq voltage | 0,00 | 40,00 | % | 0,00 | 606 | Voltage at 0 Hz as % of $U_{nmot}$ |
| P1.15 | Torque Boost | 0 | 1 | | 0 | 109 | **0** = Disabled<br>**1** = Enabled |
| P1.16 | Switching frequency | 1,5 | 16,0 | kHz | 4,0 / 2,0 | 601 | PWM frequency. If values are higher than default, reduce the current capacity |
| P1.17 | Brake Chopper | 0 | 2 | | 0 | 504 | **0** = Disabled<br>**1** = Enabled: Always<br>**2** = Run state |

*Table 5.3: Motor settings*

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P1.19 | Motor identification | 0 | 1 | | 0 | 631 | **0** = Not active<br>**1** = Standstill identification (need run command within 20 s to activate) |
| P1.20 | Rs voltage drop | 0,00 | 100,00 | % | 0,00 | 662 | Voltage drop over motor windings as % of $U_{nmot}$ at nominal current |
| P1.21 | Overvoltage controller | 0 | 2 | | 1 | 607 | **0** = Disabled<br>**1** = Enabled, Standard mode<br>**2** = Enabled, Shock load mode |
| P1.22 | Undervoltage controller | 0 | 1 | | 1 | 608 | **0** = Disable<br>**1** = Enable |
| P1.23 | Sine filter | 0 | 1 | | 0 | 522 | **0** = not in use<br>**1** = in use |
| P1.24 | Modulator type | 0 | 65535 | | 28928 | 648 | Modulator configuration word:<br>**B1** = discontinuous modulation (DPWMMIN)<br>**B2** = Pulse dropping in overmodulation<br>**B6** = under modulation<br>**B8** = instantaneous DC voltage compensation*<br>**B11** = Low noise<br>**B12** = Dead time compensation*<br>**B13** = Flux error compensation*<br>*Enable by default |

*Table 5.3: Motor settings*

**NOTE!** These parameters are shown, when P17.2 = 0.

## 5.4 Start / stop setup (Control panel: Menu PAR -> P2)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P2.1 | Remote Control Place Selection | 0 | 1 | | 0 | 172 | **0** = I / O terminals<br>**1** = Fieldbus |
| P2.2 | Start function | 0 | 1 | | 0 | 505 | **0** = Ramp<br>**1** = Flying start |
| P2.3 | Stop function | 0 | 1 | | 0 | 506 | **0** = Coasting<br>**1** = Ramp |
| P2.4 | I / O Start / Stop logic | 0 | 3 | | 2 | 300 | **I / O control signal 1** / **I / O control signal 2**<br>**0** Forward / Reverse<br>**1** Fwd (edge) / Inverted Stop<br>**2** Fwd (edge) / Rev (edge)<br>**3** Start / Reverse |
| P2.5 | Local / Remote | 0 | 1 | | 0 | 211 | **0** = Remote control<br>**1** = Local control |
| P2.6 | Keypad control direction | 0 | 1 | | 0 | 123 | **0** = Forward<br>**1** = Reverse |
| P2.9 | Keypad button lock | 0 | 1 | | 0 | 15520 | **0** = unlock all keypad button<br>**1** = Lock/Rem button locked |

*Table 5.4: Start / stop setup*

## 5.5 Frequency references (Control panel: Menu PAR -> P3)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P3.1 | Min frequency | 0,00 | P3.2 | Hz | 0,00 | 101 | Minimum allowed frequency reference |
| P3.2 | Max frequency | P3.1 | 320,00 | Hz | 50,00 / 60,00 | 102 | Maximum allowed frequency reference |
| P3.3 | Remote Control Place frequency reference selection | 1 | 6 | | 4 | 117 | **1** = Preset Speed 0<br>**2** = Keypad<br>**3** = Fieldbus<br>**4** = AI1<br>**5** = AI2<br>**6** = PI |
| P3.4 | Preset speed 0 | P3.1 | P3.2 | Hz | 5,00 | 180 | Activated by digital inputs |
| P3.5 | Preset speed 1 | P3.1 | P3.2 | Hz | 10,00 | 105 | Activated by digital inputs |
| P3.6 | Preset speed 2 | P3.1 | P3.2 | Hz | 15,00 | 106 | Activated by digital inputs |
| P3.7 | Preset speed 3 | P3.1 | P3.2 | Hz | 20,00 | 126 | Activated by digital inputs |
| P3.8 | Preset speed 4 | P3.1 | P3.2 | Hz | 25,00 | 127 | Activated by digital inputs |
| P3.9 | Preset speed 5 | P3.1 | P3.2 | Hz | 30,00 | 128 | Activated by digital inputs |
| P3.10 | Preset speed 6 | P3.1 | P3.2 | Hz | 40,00 | 129 | Activated by digital inputs |
| P3.11 | Preset speed 7 | P3.1 | P3.2 | Hz | 50,00 | 130 | Activated by digital inputs |

*Table 5.5: Frequency references*

**NOTE!** These parameters are shown, when P17.2 = 0.

## 5.6 Ramps and brakes setup (Control panel: Menu PAR -> P4)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P4.1 | Ramp S-shape | 0,0 | 10,0 | s | 0,0 | 500 | **0** = Linear<br>**>0** = S-curve ramp time |
| P4.2 | Acceleration time 1 | 0,1 | 3000,0 | s | 3,0 | 103 | Defines the time required for the output frequency to increase from zero frequency to maximum frequency |
| P4.3 | Deceleration time 1 | 0,1 | 3000,0 | s | 3,0 | 104 | Defines the time required for the output frequency to decrease from maximum frequency to zero frequency |
| P4.4 | Ramp S-shape 2 | 0,0 | 10,0 | s | 0,0 | 501 | See the parameter P4.1 |
| P4.5 | Acceleration time 2 | 0,1 | 3000,0 | s | 10,0 | 502 | See the parameter P4.2 |
| P4.6 | Deceleration time 2 | 0,1 | 3000,0 | s | 10,0 | 503 | See the parameter P4.3 |
| P4.7 | Flux Braking | 0 | 3 | | 0 | 520 | **0** = Off<br>**1** = Deceleration<br>**2** = Chopper<br>**3** = Full Mode |
| P4.8 | Flux Braking Current | 0,5 x $I_{Nunit}$ | 2,0 x $I_{Nunit}$ | A | $I_{Nunit}$ | 519 | |
| P4.9 | DC Braking Current | 0,3 x $I_{Nunit}$ | 2,0 x $I_{Nunit}$ | A | $I_{Nunit}$ | 507 | Defines the current injected into the motor during DC brakeing |
| P4.10 | Stop DC current time | 0,00 | 600,00 | s | 0,00 | 508 | Determines if braking is ON or OFF and the braking time of the DC-brake when the motor is stopping<br>**0** = Not active |
| P4.11 | Stop DC current frequency | 0,10 | 10,00 | Hz | 1,50 | 515 | The output frequency at which the DC-braking is applied |
| P4.12 | Start DC current time | 0,00 | 600,00 | s | 0,00 | 516 | **0** = Not active |

*Table 5.6: Ramps and brakes setup*

## 5.7 Digital inputs (Control panel: Menu PAR -> P5)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P5.1 | I / O control signal 1 | 0 | 6 | | 1 | 403 | **0** = Not used<br>**1** = DI1<br>**2** = DI2<br>**3** = DI3<br>**4** = DI4<br>**5** = DI5<br>**6** = DI6 |
| P5.2 | I / O control signal 2 | 0 | 6 | | 2 | 404 | As parameter 5.1 |
| P5.3 | Reverse | 0 | 6 | | 0 | 412 | As parameter 5.1 |
| P5.4 | Ext. fault Close | 0 | 6 | | 6 | 405 | As parameter 5.1 |
| P5.5 | Ext. fault Open | 0 | 6 | | 0 | 406 | As parameter 5.1 |
| P5.6 | Fault reset | 0 | 6 | | 3 | 414 | As parameter 5.1 |
| P5.7 | Run enable | 0 | 6 | | 0 | 407 | As parameter 5.1 |
| P5.8 | Preset speed B0 | 0 | 6 | | 4 | 419 | As parameter 5.1 |
| P5.9 | Preset speed B1 | 0 | 6 | | 5 | 420 | As parameter 5.1 |
| P5.10 | Preset speed B2 | 0 | 6 | | 0 | 421 | As parameter 5.1 |
| P5.11 | Ramp time 2 selection | 0 | 6 | | 0 | 408 | As parameter 5.1 |
| P5.12 | Disable PI | 0 | 6 | | 0 | 1020 | As parameter 5.1 |
| P5.13 | Force to I/O | 0 | 6 | | 0 | 409 | As parameter 5.1 |

*Table 5.7: Digital inputs*

## 5.8 Analogue inputs (Control panel: Menu PAR -> P6)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P6.1 | AI1 Signal range | 0 | 1 | | 0 | 379 | **0** = 0 - 100% ( 0 - 10 V)<br>**1** = 20% - 100% ( 2 - 10 V) |
| P6.2 | AI1 Custom min | -100,00 | 100,00 | % | 0,00 | 380 | 0,00 = no min scaling |
| P6.3 | AI1 Custom max | -100,00 | 300,00 | % | 100,00 | 381 | 100,00 = no max scaling |
| P6.4 | AI1 filter time | 0,0 | 10,0 | s | 0,1 | 378 | 0 = no filtering |
| P6.5 | AI2 signal range | 0 | 1 | | 0 | 390 | 0 = 0 - 100% ( 0 - 20 mA)<br>1 = 20% - 100% (4 -20 mA) |
| P6.6 | AI2 Custom min | -100,00 | 100,00 | % | 0,00 | 391 | 0,00 = no min scaling |
| P6.7 | AI2 Custom max | -100,00 | 300,00 | % | 100,00 | 392 | 100,00 = no max scaling |
| P6.8 | AI2 filter time | 0,0 | 10,0 | s | 0,1 | 389 | **0** = no filtering |

*Table 5.8: Analogue inputs*

## 5.9 Digital outputs (Control panel: Menu PAR -> P8)

| Code | Parameter | Min | Max | Unit | Default | ID | Selections |
|---|---|---|---|---|---|---|---|
| P8.1 | RO1 signal selection | 0 | 11 | | 2 | 313 | **0** = Not used<br>**1** = Ready<br>**2** = Run<br>**3** = Fault<br>**4** = Fault Inverted<br>**5** = Warning<br>**6** = Reversed<br>**7** = At Speed<br>**8** = Motor regulator active<br>**9** = FB Control Word.B13<br>**10** = FB Control Word.B14<br>**11** = FB Control Word.B15 |
| P8.2 | RO2 signal selcetion | 0 | 11 | | 3 | 314 | As parameter 8.1 |
| P8.3 | DO1 signal selcetion | 0 | 11 | | 1 | 312 | As parameter 8.1 |
| P8.4 | RO2 inversion | 0 | 1 | | 0 | 1588 | **0** = No inversion<br>**1** = Inverted |

*Table 5.9: Digital outputs*

## 5.10 Analogue outputs (Control panel: Menu PAR -> P9)

| Code | Parameter | Min | Max | Unit | Default | ID | Selections |
|---|---|---|---|---|---|---|---|
| P9.1 | Analog output signal selection | 0 | 4 | | 1 | 307 | **0** = Not used<br>**1** = Output freq. (0-$f_{max}$)<br>**2** = Output current (0-$I_{nMotor}$)<br>**3** = Motor torque (0-$T_{nMotor}$)<br>**4** = PI output (0 - 100%) |
| P9.2 | Analog output minimum | 0 | 1 | | 0 | 310 | **0** = 0 mA<br>**1** = 4 mA |

*Table 5.10: Analogue outputs*

## 5.11 Protections (Control panel: Menu PAR -> P13)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P13.1 | Analog Input low fault | 0 | 2 | | 1 | 700 | **0** = No action<br>**1** = Alarm<br>**2** = Fault: Coast |
| P13.2 | Under voltage fault | 1 | 2 | | 2 | 727 | **1 =** No response (no fault generated but drive still stops modulation)<br>**2 =** Fault:Coast |
| P13.3 | Earth fault | 0 | 2 | | 2 | 703 | As parameter 13.1 |
| P13.4 | Output Phase Fault | 0 | 2 | | 2 | 702 | As parameter 13.1 |
| P13.5 | Stall protection | 0 | 2 | | 0 | 709 | As parameter 13.1 |
| P13.6 | Under load protection | 0 | 2 | | 0 | 713 | As parameter 13.1 |
| P13.7 | Motor thermal protection | 0 | 2 | | 2 | 704 | As parameter 13.1 |
| P13.8 | Mtp:Ambient temperature | -20 | 100 | °C | 40 | 705 | Environment temperation |
| P13.9 | Mtp:Zero speed cooling | 0,0 | 150,0 | % | 40,0 | 706 | Cooling as % at 0 speed |
| P13.10 | Mtp:Thermal time constant | 1 | 200 | min | 45 | 707 | Motor thermal time constant |
| P13.23 | FWD/REV conflict supervision | 0 | 2 | | 1 | 1463 | Same as P13.1 |

*Table 5.11: Protections*

**NOTE!** These parameters are shown, when **P17.2 = 0.**

## 5.12 Fault autoreset parameters (Control panel: Menu PAR -> P14)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P14.1 | Automatic Reset | 0 | 1 | | 0 | 731 | **0** = Disabled<br>**1** = Enable |
| P14.2 | Wait time | 0,10 | 10,00 | s | 0,50 | 717 | Waiting time after fault |
| P14.3 | Trial time | 0,00 | 60,00 | s | 30,00 | 718 | Maximum time for trials |
| P14.5 | Restart Function | 0 | 2 | | 2 | 719 | **0** = Ramping<br>**1** = Flying<br>**2** = From Start Function |

*Table 5.12: Fault autoreset parameters*

**NOTE!** These parameters are shown, when **P17.2 = 0.**

## 5.13 PI control parameters (Control panel: Menu PAR -> P15)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P15.1 | Setpoint source selection | 0 | 3 | | 0 | 332 | **0** = Fixed setpoint %<br>**1** = AI1<br>**2** = AI2<br>**3** = Fiel-bus (ProcessDataIn1) |
| P15.2 | Fixed setpoint | 0,0 | 100,0 | % | 50,0 | 167 | Fixed setpoint |
| P15.4 | Feedback source selction | 0 | 2 | | 1 | 334 | **0** = AI1<br>**1** = AI2<br>**2** = Field-bus (Process-DataIn2) |
| P15.5 | Feedback value minumum | 0,0 | 50,0 | % | 0,0 | 336 | Value at minimum signal |
| P15.6 | Feedback value maximum | 10,0 | 300,0 | % | 100,0 | 337 | Value at maximum signal |
| P15.7 | P gain | 0,0 | 1000,0 | % | 100,0 | 118 | Proportional gain |
| P15.8 | I time | 0,00 | 320,00 | s | 10,00 | 119 | Integrative time |
| P15.10 | Error inversion | 0 | 1 | | 0 | 340 | **0** = Direct (Feedback < Set-point ->Increase PID output)<br>**1** = Inverted (Feedback > Setpoint ->Decrease PID output) |

*Table 5.13: PI control parameters*

**NOTE!** These parameters are shown, when **P17.2 = 0.**

## 5.14 Application Setting (Control panel: Menu PAR -> P17)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|---|---|---|---|---|---|---|---|
| P17.1 | Application Type | 0 | 3 | | 0 | 540 | **0 =** Basic<br>**1 =** Pump<br>**2 =** Fan drive<br>**3 =** High Torque<br>**NOTE!** Visible only when Startup wizard is active |
| P17.2 | Parameter conceal | 0 | 1 | | 1 | 115 | **0** = All parameters visible<br>**1** = Only quick setup parameter group visible |

*Table 5.14: Application Setting parameters*

## 5.15 System parameters

| Code | Parameter | Min | Max | Default | ID | Note |
|---|---|---|---|---|---|---|
| **Software information (MENU PAR -> V1)** | | | | | | |
| V1.1 | API SW ID | | | | 2314 | |
| V1.2 | API SW version | | | | 835 | |
| V1.3 | Power SW ID | | | | 2315 | |
| V1.4 | Power SW version | | | | 834 | |
| V1.5 | Application ID | | | | 837 | |
| V1.6 | Application revision | | | | 838 | |
| V1.7 | System load | | | | 839 | |
| **Fieldbus parameter (MENU PAR -> V2)** | | | | | | |
| V2.1 | Communication status | | | | 808 | Status of Modbus communication. Format: xx.yyy where xx = 0 - 64 (Number of error messages) yyy = 0 - 999 (Number of good messages) |
| P2.2 | Fieldbus protocol | 0 | 1 | 0 | 809 | **0** = Not used<br>**1** = Modbus used |
| P2.3 | Slave address | 1 | 255 | 1 | 810 | |
| P2.4 | Baud rate | 0 | 5 | 5 | 811 | **0** = 300<br>**1** = 600<br>**2** = 1200<br>**3** = 2400<br>**4** = 4800<br>**5** = 9600 |
| P2.7 | Communication time out | 0 | 255 | 10 | 814 | **1** = 1 sec<br>**2** = 2 secs, etc |

*Table 5.15: System parameters*

| Code | Parameter | Min | Max | Default | ID | Note |
|---|---|---|---|---|---|---|
| P2.8 | Reset communication status | 0 | 1 | 0 | 815 | |
| **Other information** | | | | | | |
| V3.1 | MWh counter | | | | 827 | Million Watt Hour |
| V3.2 | Power on days | | | | 828 | |
| V3.3 | Power on hours | | | | 829 | |
| V3.4 | Run counter: Days | | | | 840 | |
| V3.5 | Run counter: Hours | | | | 841 | |
| V3.6 | Fault counter | | | | 842 | |
| P4.2 | Restore factory defaults | 0 | 1 | 0 | 831 | **1** = Restores factory defaults for all parameters |
| F5.x | Active Fault menu | | | | | |
| F6.x | Fault History menu | | | | | |

*Table 5.15: System parameters*

## 6. FAULT TRACING

| Fault code | Fault name | Fault code | Fault name |
|---|---|---|---|
| **1** | Overcurrent | **22** | EEPROM checksum fault |
| **2** | Overvoltage | **25** | Microcontroller watchdog fault |
| **3** | Earth fault | **27** | Back EMF protection |
| **8** | System fault | **34** | Internal bus communication |
| **9** | Undervoltage | **35** | Application fault |
| **11** | Output phase fault | **41** | IGBT Overtemperature |
| **13** | Frequency converter undertemperature | **50** | Analog input select 20% - 100% (selected signal range 4 to 20 mA or 2 to 10 V) |
| **14** | Frequency converter over-temperature | **51** | External fault |
| **15** | Motor stalled | **53** | Fieldbus fault |
| **16** | Motor overtemperature | **55** | Wrong run fault |
| **17** | Motor underload | **57** | Idenfication fault |

*Table 6.1: Fault codes. See User Manual for detailed fault descriptions.*

# 7. GENERAL DATA

| | | | | | |
|---|---|---|---|---|---|
| **Dimensions and weight** | Frame | Height (mm) | Width (mm) | Depth (mm) | Weight (kg) |
| | MI1 | 160 | 66 | 98 | 0.5 |
| | MI2 | 195 | 90 | 102 | 0.7 |
| | MI3 | 254 | 100 | 109 | 1 |
| **Supply network** | Networks | Vacon 10 (400 V) cannot be used with corner grounded networks | | | |
| | Short circuit current | Maximum short circuit current has to be < 50 kA | | | |
| **Motor connection** | Output voltage | 0 - $U_{in}$ | | | |
| | Output current | Continuous rated current $I_N$ at ambient temperature max. +50 °C (depends on the unit size), overload<br>1.5 x $I_N$ max. 1 min / 10 min | | | |
| **Ambient conditions** | Ambient operating temperature | -10 °C (no frost)...+40 / 50 °C (depends on the unit size): rated loadability $I_N$<br>Side by side installation for MI1-3 it is always 40 °C; For IP21/ Nema1 option in MI1-3 the maximum temparture is also 40 °C | | | |
| | Storage temperature | -40 °C...+70 °C | | | |
| | Relative humidity | 0...95% RH, non-condensing, non-corrosive, no dripping water | | | |
| | Altitude | 100% load capacity (no derating) up to 1000 m. 1% derating for each 100 m above 1000 m; max. 2000 m | | | |
| | Enclosure class | IP20 / IP21 / Nema1 for MI1-3 | | | |
| | Pollution degree | PD2 | | | |
| **EMC** | Immunity | Complies with EN50082-1, -2, EN61800-3 | | | |
| | Emissions(See detailed descriptions in Vacon 10 User Manual at: www.vacon.com) | 230V: Complies with EMC category C2; With an internal RFI filter<br>400V: Complies with EMC category C2; With an internal RFI filter<br>Both: No EMC emission protection (Vacon level N): Without RFI filter | | | |
| **Standards** | | For EMC: EN61800-3<br>For safety: UL508C, EN61800-5 | | | |
| **Certificates and manufacturer's declarations of conformity** | | For safety: CE, UL, cUL<br>For EMC: CE<br>(see unit nameplate for more detailed approvals) | | | |

<table>
<tr><th rowspan="2">Cable and fuse requirements (See detailed data in Vacon 10 User Manual at: www.vacon.com)<br>380 - 480 V, 3~<br>208 – 240 V, 3~</th><th rowspan="2">Frame</th><th rowspan="2">Fuse (A)</th><th rowspan="2">Mains cable Cu ($mm^2$)</th><th colspan="3">Terminal cable min-max ($mm^2$)</th></tr>
<tr><th>Main</th><th>Earth</th><th>Control & relay</th></tr>
<tr><td rowspan="3"></td><td>MI1</td><td>6</td><td rowspan="2">3*1.5+1.5</td><td colspan="2" rowspan="2">1.5-4</td><td rowspan="11">0.5-1.5</td></tr>
<tr><td>MI2</td><td>10</td></tr>
<tr><td>MI3</td><td>20</td><td>3*2.5+2.5</td><td colspan="2">1.5-6</td></tr>
<tr><td rowspan="2">115 V, 1~</td><td>MI2</td><td>20</td><td>2*2.5+2.5</td><td colspan="2" rowspan="4">1.5-4</td></tr>
<tr><td>MI3</td><td>32</td><td>2*6+6</td></tr>
<tr><td rowspan="3">208 – 240, 1~</td><td>MI1</td><td>10</td><td>2*1.5+1.5</td></tr>
<tr><td>MI2</td><td>20</td><td>2*2.5+2.5</td></tr>
<tr><td>MI3</td><td>32</td><td>2*6+6</td><td colspan="2">1.5-6</td></tr>
<tr><td rowspan="3">575V</td><td>MI3</td><td>6</td><td rowspan="2">3*1.5+1.5</td><td colspan="2" rowspan="2">1.5-4</td></tr>
<tr><td>MI3</td><td>10</td></tr>
<tr><td>MI3</td><td>20</td><td>3*2.5+2.5</td><td colspan="2">1.5-6</td></tr>
</table>

- With above-mentioned fuses, the drive can be connected to power supply the short circuit current of which is max. 50 kA.
- Use cables with heat resistance of at least +70 °C.
- The fuses function also as cable overload protection.
- These instructions apply only to cases with one motor and one cable connection from the frequency converter to the motor.
- To fulfil standard EN61800-5-1, the protective conductor should be **at least 10 $mm^2$ Cu or 16 $mm^2$ Al**. Another possibility is to use an additional protective conductor of at least the same size as the original one.

*Vacon 10 power ratings*

| Mains voltage 208 - 240 V, 50 / 60 Hz, 1~ series | | | | | | | |
|---|---|---|---|---|---|---|---|
| Freq. converter type | Rated loadability | | Motor shaft power | | Nominal input current | Mechanical size | Weight (kg) |
| | 100% contin. current $I_N$ [A] | 150% over-load current [A] | P [HP] | P [KW] | [A] | | |
| 0001 | 1.7 | 2.6 | 0.33 | 0.25 | 4.2 | MI1 | 0.55 |
| 0002 | 2.4 | 3.6 | 0.5 | 0.37 | 5.7 | MI1 | 0.55 |
| 0003 | 2.8 | 4.2 | 0.75 | 0.55 | 6.6 | MI1 | 0.55 |
| 0004 | 3.7 | 5.6 | 1 | 0.75 | 8.3 | MI2 | 0.7 |
| 0005 | 4.8 | 7.2 | 1.5 | 1.1 | 11.2 | MI2 | 0.7 |
| 0007 | 7 | 10.5 | 2 | 1.5 | 14.1 | MI2 | 0.7 |
| 0009* | 9.6 | 14.4 | 3 | 2.2 | 22.1 | MI3 | 0.99 |

*Table 7.1: Vacon 10 power ratings, 208 - 240 V*

* The maximum ambient operating temperature of this drive is 40 °C!

| Mains voltage 208 - 240 V, 50 / 60 Hz, 3~ series | | | | | | | |
|---|---|---|---|---|---|---|---|
| Freq. converter type | Rated loadability | | Motor shaft power | | Nominal input current | Mechanical size | Weight (kg) |
| | 100% contin. current $I_N$ [A] | 150% over-load current [A] | P [HP] | P [KW] | [A] | | |
| 0001 | 1.7 | 2.6 | 0.33 | 0.25 | 2.7 | MI1 | 0.55 |
| 0002 | 2.4 | 3.6 | 0.5 | 0.37 | 3.5 | MI1 | 0.55 |
| 0003 | 2.8 | 4.2 | 0.75 | 0.55 | 3.8 | MI1 | 0.55 |
| 0004 | 3.7 | 5.6 | 1 | 0.75 | 4.3 | MI2 | 0.7 |
| 0005 | 4.8 | 7.2 | 1.5 | 1.1 | 6.8 | MI2 | 0.7 |
| 0007* | 7 | 10.5 | 2 | 1.5 | 8.4 | MI2 | 0.7 |
| 0011* | 11 | 16.5 | 3 | 2.2 | 13.4 | MI3 | 0.99 |

*Table 7.2: Vacon 10 power ratings, 208 - 240 V, 3~*

*The maximum ambient operating temperature of this drive is +40°C!

| Mains voltage 115 V, 50 / 60 Hz, 1~ series | | | | | | | |
|---|---|---|---|---|---|---|---|
| Freq. converter type | Rated loadability | | Motor shaft power | | Nominal input current | Mechanical size | Weight (Kg) |
| | 100% contin. current $I_N$ [A] | 150% over-load current [A] | P [HP] | P [KW] | [A] | | |
| 0001 | 1.7 | 2.6 | 0.33 | 0.25 | 9.2 | MI2 | 0.7 |
| 0002 | 2.4 | 3.6 | 0.5 | 0.37 | 11.6 | MI2 | 0.7 |
| 0003 | 2.8 | 4.2 | 0.75 | 0.55 | 12.4 | MI2 | 0.7 |
| 0004 | 3.7 | 5.6 | 1 | 0.75 | 15 | MI2 | 0.7 |
| 0005 | 4.8 | 7.2 | 1.5 | 1.1 | 16.5 | MI3 | 0.99 |

*Table 7.3: Vacon 10 power ratings, 115 V, 1~*

| Mains voltage 380 - 480 V, 50 / 60 Hz, 3~ series | | | | | | | |
|---|---|---|---|---|---|---|---|
| Freq. converter type | Rated loadability | | Motor shaft power | | Nominal input current | Mechanical size | Weight (kg) |
| | 100% contin. current $I_N$ [A] | 150% over-load current [A] | P [HP] | P [KW] | [A] | | |
| 0001 | 1.3 | 2 | 0.5 | 0.37 | 2.2 | MI1 | 0.55 |
| 0002 | 1.9 | 2.9 | 0.75 | 0.55 | 2.8 | MI1 | 0.55 |
| 0003 | 2.4 | 3.6 | 1 | 0.75 | 3.2 | MI1 | 0.55 |
| 0004 | 3.3 | 5 | 1.5 | 1.1 | 4 | MI2 | 0.7 |
| 0005 | 4.3 | 6.5 | 2 | 1.5 | 5.6 | MI2 | 0.7 |
| 0006 | 5.6 | 8.4 | 3 | 2.2 | 7.3 | MI2 | 0.7 |
| 0008 | 7.6 | 11.4 | 4 | 3 | 9.6 | MI3 | 0,99 |
| 0009 | 9 | 13.5 | 5 | 4 | 11.5 | MI3 | 0.99 |
| 0012 | 12 | 18 | 7.5 | 5.5 | 14.,9 | MI3 | 0.99 |

*Table 7.4: Vacon 10 power ratings, 380 - 480 V*

| Mains voltage 575 V, 50 / 60 Hz, 3~ series | | | | | | | |
|---|---|---|---|---|---|---|---|
| Freq. converter type | Rated loadability | | Motor shaft power | | Nominal input current | Mechanical size | Weight (kg) |
| | 100% contin. current $I_N$ [A] | 150% over-load current [A] | P [HP] | P [KW] | [A] | | |
| 0002 | 1,7 | 2,6 | 1 | 0,75 | 2 | MI3 | 0,99 |
| 0003 | 2,7 | 4,2 | 2 | 1,5 | 3,6 | MI3 | 0,99 |
| 0004 | 3,9 | 5,9 | 3 | 2,2 | 5 | MI3 | 0,99 |
| 0006 | 6,1 | 9,2 | 5 | 3.7 | 7,6 | MI3 | 0,99 |
| 0009 | 9 | 13,5 | 7.5 | 5,5 | 10,4 | MI3 | 0,99 |

*Table 7.5: Vacon 10 power ratings, 575 V*

**Note:** The input currents are calculated values with 100 kVA line transformer supply.

*Quick Modbus setup*

| | |
|---|---|
| **1** | A: Select Fieldbus as remote control place: P2.1 to1 – Fieldbus<br>B: Set Modbus RTU protocol to "ON": S2.2 to 1 – Modbus |
| **2** | A. Set Control Word to "0" (2001)<br>B. Set Control Word to "1" (2001)<br>C. Frequency converter status is RUN<br>D. Set Reference value to "5000" (50,00%) (2003)<br>E. Actual Speed is 5000 (25.00 Hz if MinFreq is 0.00 Hz and MaxFreq is 50.00 Hz)<br>F. Set Control Word to "0" (2001)<br>G. Frequency converter status is STOP |

VACON®

DRIVEN BY DRIVES

Find your nearest Vacon office
on the Internet at:

www.vacon.com

Manual authoring:
documentation@vacon.com

Vacon Plc.
Runsorintie 7
65380 Vaasa
Finland

Subject to change without prior notice



Document ID:
DPD00714

Rev. E1